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IS 8785 (1978): Carbon dioxide core binder system (binder and breakdown agent) for use in foundries [MTD 14: Foundry]



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IS: 8785 - 1978

Indian Standard

SPECIFICATION FOR CO₂ CORE BINDER
SYSTEM (BINDER AND BREAK-DOWN AGENT)
FOR USE IN FOUNDRIES

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Indian Standard

SPECIFICATION FOR CO₂ CORE BINDER SYSTEM (BINDER AND BREAK-DOWN AGENT) FOR USE IN FOUNDRIES

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Indian Standard

SPECIFICATION FOR CO₂ CORE BINDER SYSTEM (BINDER AND BREAK-DOWN AGENT) FOR USE IN FOUNDRIES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 12 April 1978, after the draft finalized by the Foundry Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 One of the common methods of producing medium to large size cores in iron and steel foundries is that of using sodium silicate based core binder with silica sand. The binder is set by passing carbon dioxide gas through the cores. One of the major drawbacks of this system is that the silicate bonded sand sinters during metal pouring and the knock-out of used sand is difficult to achieve as compared to other organic binder systems. To improve the knock-out properties a break-down agent is usually added while sand mixing. Sometimes, a break-down agent is added to the binder itself. The exact compositions of the binder and the break-down agents are often proprietary in nature and are guarded trade secrets of the foundry chemical manufacturing companies.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the quality requirements for CO₂ core binder system (binder and break-down agent) for use in foundries.

2. SUPPLY OF MATERIAL

2.1 General requirements relating to supply of CO₂ core binder and break-down agent shall be as laid down in IS: 1387-1967†.

*Rules for rounding off numerical values (*revised*).

†General requirements for the supply of metallurgical materials (*first revision*).

3. DESCRIPTION

3.1 CO₂ Core Binder — The binder shall be supplied in the form of sodium silicate base thick syrupy liquid. The composition of the product may be divulged to the purchaser, if agreed to between the purchaser and the manufacturer.

3.2 The break-down agent shall be supplied either in powder form or in liquid form.

3.3 The break-down agent shall be incorporated along with the binder itself, if required.

4. REQUIREMENTS

4.1 The sodium silicate used as a CO₂ core binder shall conform to the requirements of any of the grades 1, 2, 3 or 4 specified in IS : 6773-1978*.

4.2 The CO₂ core binder conforming to Grade 1 of IS : 6773-1978* and the break-down agent when tested as a pair as detailed in Appendix A, shall conform to the requirements given in **4.2.1** to **4.4**.

4.2.1 Gassed shear strength after one hour shall be 0.387 ± 0.035 MPa (3.87 ± 0.35 kgf/cm²) and after four hours it shall be 0.422 ± 0.035 MPa (4.22 ± 0.35 kgf/cm²).

4.2.2 Break-Down Properties — Retained shear strength after firing for 3 minutes shall be 0.176 ± 0.035 MPa (1.76 ± 0.35 kgf/cm²) and after firing for 10 minutes it shall be 0.14 ± 0.035 MPa (1.40 ± 0.35 kgf/cm²). Cracks should appear on the specimen after firing.

4.3 The gassed samples, when stored up to 24 hours in an atmosphere of 40-60 percent humidity shall not give a friable surface.

4.4 The gas content shall be 9 to 13 ml/g.

NOTE — The requirements as specified in **4.2.1** to **4.4** shall also serve as minimum requirements for any other combination of sodium silicate binder (other than specified in IS : 6773-1978*) and break-down agent.

5. SAMPLING

5.1 Representative samples from each batch of the manufacture for both the products shall be drawn for testing according to the method given in Appendix B.

6. PACKING

6.1 The CO₂ core binder shall be packed in 200-litre steel drums.

*Specification for sodium silicate for use in foundries (*first revision*).

6.2 The break-down agent powder shall be packed in polythene lined jute bags of 50 kg capacity. If supplied in liquid form, it shall be packed in 50 litre capacity steel drums/containers.

6.3 The mode of packing other than that specified in **6.2** may be agreed upon at the time of enquiry and order.

7. MARKING

7.1 Each container shall be clearly marked with the manufacturer's name or trade-mark, brand name of the product, production batch number, date of manufacture and date of expiry, if any.

7.1.1 The container may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

APPENDIX A

(Clause 4.2)

METHOD OF TEST

A-1. QUALITY OF RAW MATERIALS

A-1.1 Unless specified otherwise, sand used for preparing the standard sand mix shall conform to IS : 3018-1977*.

A-2. PREPARATION OF STANDARD SAND MIX

A-2.1 Take 5 kg of the standard sand in a paddle type laboratory sand mixer. Add 100 g (2 percent by mass of sand) of the break-down agent, mix for 90 seconds, add 250 g (5 percent of sand) core binder and mix for another 3 minutes. Discharge the sand into a polythene bag, close it airtight and preserve the sand for testing.

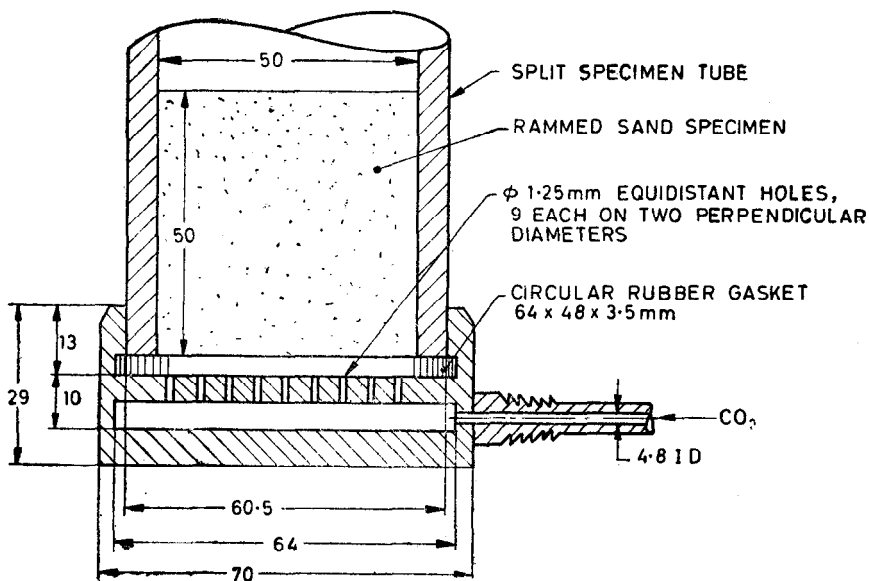
A-3. Prepare standard 50 × 50 mm, three-ram cylindrical specimen in a split specimen tube (see 5 of IS : 1918-1966†).

*Specification for standard silica sand for raw material testing in foundries.

†Methods of physical tests for foundry sands.

A-4. GASSING WITH CO₂ GAS

A-4.1 CO₂ gas is passed through the specimen contained in the specimen split tube itself on a fixture (*see* Fig. 1). Pass CO₂ gas for 30 seconds with the specimen at the bottom and for another 30 seconds after inverting the specimen tube. The gas pressure is maintained at 0.035 MPa (0.35 kgf/cm²) at the cylinder delivery.



All dimensions in millimetres.

FIG. 1 SECTION OF CO₂ GASSING FIXTURE

A-5. TEST FOR GASED SHEAR STRENGTH

A-5.1 Test the shear strength of the gassed specimens after keeping them in open air for the specified times (*see* 4.2.1). The test procedure shall be as given in IS : 1918-1966*.

A-6. TEST FOR BREAK-DOWN PROPERTIES (RETAINED SHEAR STRENGTH)

A-6.1 Six specimens after gassing as given in A-4.1 are selected. Three are heated in a furnace at 1 000°C for 3 minutes and another three for

*Methods for physical tests for foundry sands.

10 minutes. Specimens are allowed to cool to room temperature and tested for shear strength as specified in IS : 1918-1966*.

A-7. TEST FOR GAS CONTENT

A-7.1 Dry to constant mass at $110^{\circ} \pm 5^{\circ}\text{C}$ a given quantity of standard mixed sand (*see A-2*). Test the gas content in accordance with the procedure given in IS : 1918-1966*.

APPENDIX B

(*Clause 5.1*)

SAMPLING OF CO₂ CORE BINDER SYSTEM (BINDER AND BREAK-DOWN AGENT) FOR USE IN FOUNDRIES

B-1. GENERAL REQUIREMENTS OF SAMPLING

B-1.0 In drawing, preparing, storing and handling samples, the precautions and directions given in **B-1.1** to **B-1.4** shall be observed.

B-1.1 Precautions shall be taken to protect the samples, sampling instruments and the containers for samples from contamination.

B-1.2 In case of sampling liquids from drums, the material shall be thoroughly mixed before drawing the sample.

B-1.3 The samples shall be placed in suitable, clean and dry containers with proper closures.

B-1.4 Each sample container shall be closed airtight after filling and marked with full details of sampling.

B-2. SCALE OF SAMPLING

B-2.1 Lot — All the containers in a single consignment of the material of one grade, type and drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared or known to consist of different grades, types or batches of manufacture, the containers shall be suitably separated and grouped to form lots as defined above.

B-2.1.1 Samples shall be tested from each lot for ascertaining conformity of the material to the requirements of the specification.

B-2.2 The number (n) of drums to be chosen from a lot shall depend on the size (N) of the lot and shall be in accordance with col 1 and 2 of Table 1

*Methods for physical tests for foundry sands.

TABLE 1 NUMBER OF DRUMS TO BE SELECTED

(Clause B-2.2)

LOT SIZE	NUMBER OF DRUMS TO BE SELECTED
(N)	(n)
(1)	(2)
Up to 10	3
11 to 20	5
21 to 30	7
31 to 50	10
51 and above	15

B-2.3 The drum to be selected for sampling shall be chosen at random, preferably with the aid of random number tables. Guidance for random selection procedures may be had from IS : 4905-1968*.

B-3. PREPARATION OF TEST SAMPLES AND NUMBER OF TESTS

B-3.1 Draw with an appropriate sampling implement a small portion of binder and break-down agent from different parts of the drums selected according to **B-2.1**. The total quantity of the solid drawn shall be approximately 500 g. In the case of liquid, the sample weighing approximately 300 g shall be withdrawn after mixing the content of the drum thoroughly and allowing the liquid to come to rest.

B-3.2 Transfer the portions collected from each drum to separate sample containers. These filled containers are termed as individual samples.

B-3.3 Out of each of the individual samples, collect equal quantities and mix them together thoroughly to form a composite sample weighing about 500 g. In case sieving is necessary, the portions from individual samples shall be sieved separately and the composite sample shall be prepared only out of the sieved material.

B-3.4 Tests for various characteristics shall be carried out on a standard sand mix prepared as specified in **A-2** for a particular combination of binder and break-down agent.

B-4. CRITERIA FOR CONFORMITY

B-4.1 All the test results for a particular combination of binder and break-down agent shall satisfy the requirements given in **4.1** to **4.4** if the lot is to be declared acceptable under this specification.

*Methods for random sampling.

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INDIAN STANDARDS

ON

FOUNDRY

IS:

- 1280-1975 Foundry moulding boxes of steel construction (*second revision*)
- 1305-1967 Graphite for use as foundry facing material (*second revision*)
- 1513-1971 Pattern equipment for foundries (*first revision*)
- 1752-1973 Coal dust for use in cast iron foundry (*second revision*)
- 1811-1961 Methods of sampling foundry sands
- 1918-1966 Methods of physical tests for foundry sands
- 1987-1974 High silica sand for use in foundries (*first revision*)
- 3018-1977 Standard silica sand for raw material testing in foundries
- 3339-1975 Silica flour for use in foundries (*first revision*)
- 3343-1975 Natural moulding sand for use in foundries (*first revision*)
- 3666-1966 Tests for foundry core oils requiring baking
- 4140-1967 Limestone for use in foundries
- 4269-1967 Dextrin for use in foundries
- 4475-1975 Crane-suspended hand-operated geared ladles for iron foundries (*first revision*)
- 4476-1975 Crane-suspended hand-operated geared ladles for steel foundries (*first revision*)
- 4604-1975 Pattern plates for machine moulding boxes (*first revision*)
- 4606-1968 Steel shot for use in foundries
- 4683-1968 Chilled iron shot and grit for use in foundries
- 4981-1975 Guide pins for foundry pattern plates (*first revision*)
- 4982-1975 Closing pins for foundry moulding boxes (*first revision*)
- 5032-1975 Recommended sizes of cupola furnace for foundry (*first revision*)
- 5303-1974 Zircon flour for use in foundries (*first revision*)
- 5824-1970 Lancets for use in foundries (*first revision*)
- 5841-1970 Fluted core cleaners for use in foundries
- 5850-1970 Star (triangular) cutters for use in foundries
- 5873-1970 Steel cut-wire shots for use in foundries
- 5904-1970 Chaplets for use in foundries
- 5981-1970 Slickers for use in foundries
- 5988-1970 Spring dowel sleeves (light and heavy patterns) for use in foundries
- 6013-1970 Trowels for use in foundries
- 6366-1971 Sprue plugs for use in foundries
- 6376-1971 Pattern lifting pins and hooks for use in foundries
- 6377-1971 Mallets for use in foundries
- 6378-1971 Pattern lifting and rapping plates
- 6401-1971 Dowel pins for use in foundries
- 6443-1971 Lifters and cleaners for use in foundries
- 6447-1971 Vent wires for use in foundries
- 6482-1971 Tampers and rammers for use in foundries
- 6773-1978 Sodium silicate for use in foundries (*first revision*)
- 6788-1973 Chromite sand for use in foundries
- 7295-1974 Chamotte
- 7297-1974 Olivine sand and flour for use in steel foundries
- 7547-1974 Steel nails used as internal chills in steel casting
- 8228-1976 Bauxite sand
- 8246-1976 Liquid resins for use in shell process in foundries
- 8250-1976 Foundry parting agents